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Original Research Article

A step towards Lichtenstein repair as a day care surgery: spinal versus local anaesthesia

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ABSTRACT

Background: Inguinal hernia repair includes 15% of the procedures in general surgery. Until now the conventional post-operative protocol was to keep patient admitted till the patient was completely mobilized and fit to return to daily activity. This leads to unnecessary occupancy of hospital beds and increased financial burden to the patients. Therefore, day care surgery or short stay surgery is the need of the hour, in which local anaesthesia can play a major part. The aim of this study was to analyse the outcomes of inguinal hernia repair with special emphasis on the use of local and spinal anaesthesia and to find out which among the two was regarded as an effective method.
Methods: A randomised control trial was conducted at MGM medical hospital, Aurangabad over a duration of two years (November 2016 to October 2018) where 100 patients of uncomplicated unilateral inguinal hernia were included. 50 patients were given spinal anaesthesia and 50 patients were given local anaesthesia. Intra-operative and post-operative complications and recovery was noted.
Results: The duration of surgery, post-operative pain and complications were significantly lesser in local anaesthesia group ($p<0.0001$). Post-operative mobilisation, micturition and starting of oral diet was significantly earlier in patients receiving local anaesthesia ($p<0.0001$). The patients in the local anaesthesia group were discharged sooner than the spinal anaesthesia group ($p<0.0001$).
Conclusions: Thus, local anaesthesia has a major role in establishing inguinal hernia repair as a day care or short stay surgery. Local anaesthesia is a safe, efficient and cost-effective option for inguinal hernia repair compared to spinal anaesthesia in terms of patient benefits and patient satisfaction.

Keywords: Inguinal hernia, Lichtenstein repair, Local anaesthesia

INTRODUCTION

Inguinal hernia is one of the oldest afflictions to plague mankind and is still one of the commonest condition a surgeon has to encounter even today. Inguinal hernia repair represents 15% of general surgery procedures. Over the centuries the surgical management has revolutionized right from using truss to laparoscopic and robotic hernioplasty. Just as the surgical techniques have evolved, so have the choice of anaesthesia and peri-operative care aimed at patient safety, pain relief and early discharge from hospital. Today techniques like general anaesthesia, regional anaesthesia like spinal/epidural/paravertebral and local anaesthesia are used in inguinal hernia surgery.[1]

Traditionally, patients undergoing inguinal hernia surgery were administered regional anaesthesia which was considered as gold standard as it is simple, cost effective with requirement of basic skills, and safe. But at the same time was associated with complications of intra operative of hypotension and post-operative complications of

nausea, vomiting, headache, backache, urinary retention.[2] Another limitation of regional anaesthesia is contra-indications like spinal deformity, dermatological conditions, clotting disorders and anti-coagulant therapy etc.

All these limitations have encouraged the use of local anaesthesia as the preferred anaesthesia technique to overcome the complications of regional anaesthesia and in turn improve the overall outcome in terms of reduced hospital stay, cost effectiveness, reduced complications and safety of patients. Many specialised hernia centres like shouldice or Lichtenstein hernia institutes have adopted the use of local anaesthesia hernia repair surgeries. Metanalysis comparing the outcome of SA vs. LA for hernia surgery which included 10 RCT concluded that LA was better than SA in pain control, urinary retention, and decreased rate of anaesthetic failure.[3] Similarly, another metanalysis comparing LA to other anaesthesia concluded LA to be better tolerated in terms of urinary retention and operative time.[4] In this study we aimed to analyse the outcomes of local versus spinal anaesthesia in Lichtenstein mesh repair hernioplasty by comparing intra-operative and post-operative surgical and anaesthetic complications, intra-operative and post-operative pain relief and recovery time.

METHODS

Study design

Double arm, single centre, prospective randomised controlled trail in MGM medical college and hospitals, Aurangabad for a period of 2 years from December 2016 to November 2018.

Sample size

The sample size was calculated as follows,

$$n = \frac{2S^2(Z1 + Z2)^2}{(M1 - M2)^2}$$

where, M1=mean test intervention taken as 3.32, M2=mean control intervention taken as 4.32, S=pooled SD taken as 1.16017, Z1=Z value associated with alpha taken as 2.32635, Z2=Z value associated with beta taken as 1.28155 and n=sample size calculated as 72 with 36 participants in each group.

Study population

Study included patients attending the OPD of MGM medical college, Aurangabad or referred from other departments.

Inclusion criteria

Patients with uncomplicated unilateral inguinal hernia between age 18-70 years were included.

Exclusion criteria

Patients with bilateral inguinal hernia, complicated inguinal hernia like obstructed/strangulated/irreducible hernia, recurrent inguinal hernia, inguinal hernia with component of femoral hernia and patients with sensitivity to local anaesthetics or contraindications for spinal anaesthesia were excluded from the study.

Procedure

Detailed history taking, clinical examination and necessary investigation for anaesthesia fitness were done after informed consent. Patients were randomised using the chit method and divided into group A; undergoing Lichtenstein's tension free hernioplasty under local anaesthesia and group B; undergoing Lichtenstein's tension free hernioplasty under spinal anaesthesia.

Technique for administration of LA

A solution of 50:50 of 2% xylocaine with 1:200000 adrenaline (5 mg/kg) and 0.5% bupivacaine (2 mg/kg) was administered by the surgeon himself at the start of the operation. The Ilio-inguinal block was administered using 21-gauge needle inserted 2 cm medial and superior to anterior superior iliac spine. Around 7-10 cc of solution is administered in the inter-muscular planes between external oblique, internal oblique and transverse abdominis muscle (Figure 1).

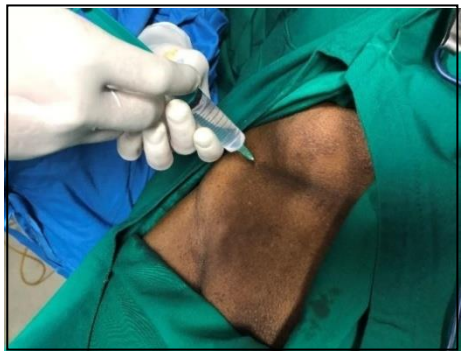

Figure 1: Needle was inserted at the level of deep ring perpendicular to skin and on loss of resistance LA solution was injected.

The needle was then inserted at 45-degree angle at same point but directed medially to inject 4-6 cc of solution. Procedure was repeated with needle directed laterally. Second step involved injecting of the anaesthetic mixture along the line of proposed skin incision and approximately 5-6 ml of the mixture was injected after negative aspiration (Figure 2). Third step included injection of the mixture in sub fascial plane beneath the external oblique muscles and approximately 10 ml of mixture was injected. The last step was to inject 2-3 ml of this solution around the pubic tubercle and another 5-6 ml of solution into the hernia sac (Figure 3). The following parameters were noted in both groups: time taken for the

procedure measured as time taken from giving anaesthesia to completion of surgery, intra-operative complications (intraoperative pain, injury to cord structures, visceral injury, additional use of sedatives), postoperative complications (recurrence, hydrocele, seroma, hematoma, testicular atrophy, scrotal oedema, backache, headache, nausea, vomiting), post-operative voidance time, post-operative resumption of enteral feeding, post-operative time for mobilisation and post-operative pain using visual analogue score at 3 hrs, 6 hrs and 12 hrs and post-operative discharge measured as number of days in hospital after surgery.

Figure 2: Needle then withdrawn further and LA given into skin at the incision site.

Figure 3: Needle completely withdrawn and reinserted just above the pubic tubercle at the level of superficial ring and LA solution is injected.

Data was entered in Microsoft excel and analysed using SPSS version 24.0th. Normality of data was assessed for quantitative variable and data was found to be normally distributed. So mean and standard deviation (SD) were calculated for quantitative variables and proportions were calculated for categorical variables.

Z test was applied to check significant difference between two groups. Also, Chi square test was applied for checking significant association between groups $p<0.05$ was considered statistically significant.

Ethical approval

The study was approved by the institutional ethical committee.

RESULTS

The mean duration of procedure in group A was 60.07±8.27 minutes and 70.80±11.26 minutes in group B. The difference in mean duration of both the procedures is significant ($p<0.0001$) (Figure 4).

Intra-operative pain

Total 17 out of 50 patients (34%) in group A experienced intraoperative pain, out of which 7 patients had to be given additional sedatives while none of the patients of the group B developed intra-operative pain or had to be given additional sedatives. The number of patients experiencing intra-operative pain was significantly more in group A ($p<0.0001$). The number of patients requiring additional use of sedatives was significantly more in group A ($p<0.0001$). None of the patients had any intra-operative injury to viscera or cord structures in both groups (Figure 5).

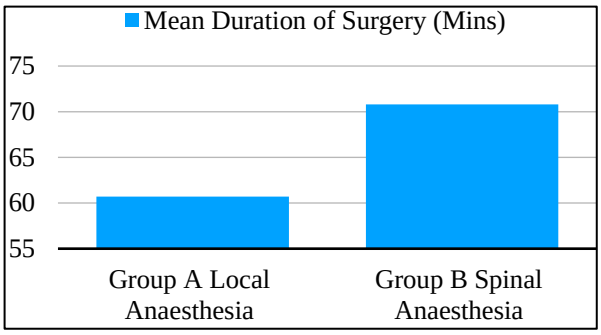

Figure 4: Comparison of mean duration of surgery of patients in groups.

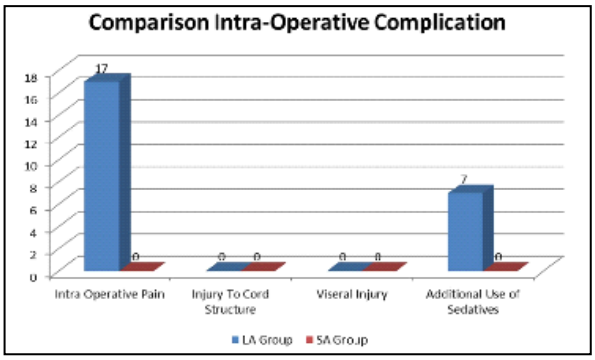

Figure 5: Comparison of mean intra-operative complications in groups.

Post-operative surgical complications

Total 2 patients of group A (4%) and 6 patients of group B (12%) developed post-operative surgical site infection. 3 patients of group A (6%) and 4 patients of group B (8%) developed seroma formation. 3 patients of group A (6%) and 6 patients of group B (12%) developed scrotal oedema. The number of patients having the above complications was not significantly different in either

groups. None of the patients in both the groups had Recurrence, hydrocele formation or testicular atrophy, post-operatively (Figure 6).

Table 1: Demographics.

Particulars	Group A (local anesthessia)	Group B (spinal anesthesia)
Total patients	50	50
Mean age (years)	46.26±17.94	48.72±17.41
Sex	All males	All males
Average weight (kg)	54.00±15.27	54.38±12.87
Co-morbidities (HTN/DM /COPD/IHD/ bronchial asthma, cirrhosis)	10 (20)	16 (32)

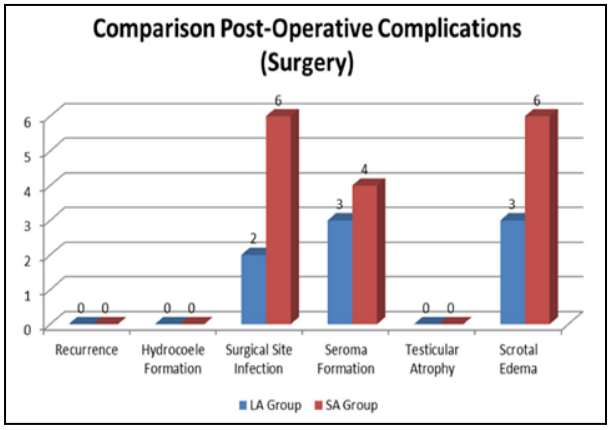

Figure 6: Comparison of mean post-operative complications (surgery).

Post-operative anaesthetic complications

In group B, 4 patients (8%) developed backache and 10patients (20%) developed headache post-operatively while none of the patients of the group A had the above symptoms (Figure 7). Thus, the incidence of backache (p=0.041) and headache (p=0.001) was significantly more in the spinal anaesthesia group. 2 patients (4%) of group A and 9 patients (8%) of group B had nausea, (p=0.025) being significantly more in patients receiving spinal anaesthesia. 3 patients (6%) of group A and 12 patients (24%) of group B had vomiting, which was significantly more in patients of spinal anaesthesia group (p=0.012). Only 1 patient (2%) of group A developed hematoma while none developed in group B However, the number of hematomacases was not significantly higher in the local anaesthesia group (p=0.315).

Post-operative pain scores

The mean VAS score after 3 hours, 6 hours, 12 hours and 24 hours was significantly lesser in the local anaesthesia group compared to the spinal anaesthesia group (p<0.0001) (Figure 8).

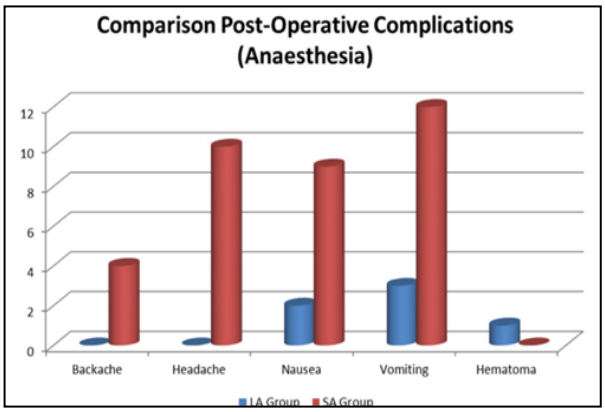

Figure 7: Comparison of mean post-operative complications (anaesthesia).

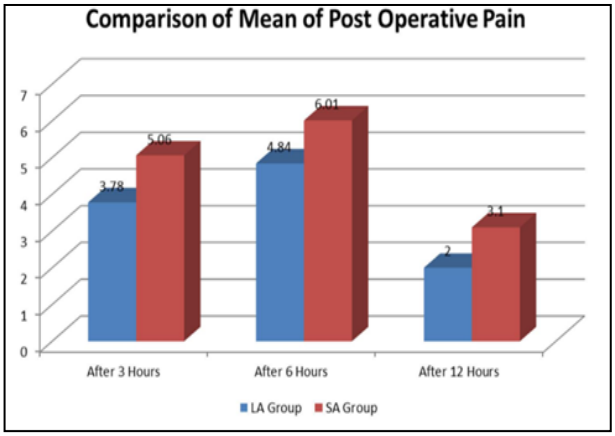

Figure 8: Comparison of mean of post-operative pain in groups.

Post-operative voidance time

The average time taken for patients to pass urine post-operatively was 3.27±2.46 hours in group A and 7.29±3.12 hours in group B. Thus, the patients in local anaesthesia group passed urine significantly earlier than the spinal anaesthesia group (p<0.0001) (Table 2).

Table 2: Post-operative voidance time.

Variables		Mean±SD	Z value	P value
Post-operative voidance time	LA Group	3.27±2.46	8.24	<0.0001
	SA Group	7.29±3.12		

Post-operative diet

The average time taken for starting oral intake in group A (1.79±1.03 hours) was significantly lesser than the group B (6.69±1.19 hours) (p<0.0001) (Table 3).

Post-operative mobilisation

In the group A 24 patients (48%) were mobilised immediately, 19 patients (38%) within 1 hour and 7 patients (14%) between 2-5 hours post-surgery. In the group B 7 patients (14%) were mobilised within 2-5 hours and the remaining 43 patients (86%) were mobilised after 5 hours. The patients in local anaesthesia group were mobilised significantly earlier than the patients in spinal anaesthesia group (p<0.0001).

Table 3: Post-operative time for starting oral diet.

Variables		Mean±SD	Z value	P value
Post-operative diet starting time (hours)	LA Group	1.79±1.03	8.24	<0.0001
	SA Group	6.69±1.19		

Post-operative discharge

In the group A, 3 patients (6%) were discharged on post - operative day 1. 41 patients (82%) by post-operative day 3 and 6 patients (12%) by postoperative day 5. In group B 22 patients (44%) were discharged 3 days after surgery, 27 patients (54%) were discharged after 5 days and 1 patient (2%) was discharged after 7 days. The patients in the local anaesthesia group were discharged significantly earlier than patients in the spinal anaesthesia group (p<0.0001) (Figure 9).

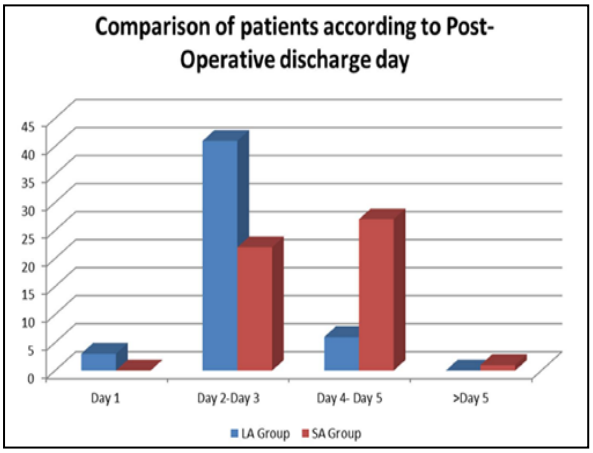

Figure 8: Comparison of patients according to post operative discharge time.

Overall outcome

Patients in local anaesthesia group had significantly shorter duration of surgery, significantly higher intra-operative pain and additional use of sedatives, equivocal results with respect to post-operative surgical complications, and significantly lesser post-operative anaesthetic complications like nausea, vomiting, headache, backache when compared with spinal anaesthesia group. Also, post-operative pain scores, voidance time, mobilization time and discharge time were significantly lesser in local anaesthesia group than spinal anaesthesia group.

DISCUSSION

The mean age of patients receiving local anaesthesia (group A) was 46.26±17.94 years and spinal anaesthesia (group B) was 48.72±17.41 years with no significant difference between the average age of both the groups (p<0.610). All patients in both groups were males. 20% of the patients (10/50) who underwent local anaesthesia, 32%of the patients (16/50) who underwent spinal anaesthesia had pre-existing co-morbid conditions. Bhedi et al demonstrated that local anaesthesia can be given to patients not receiving anaesthesia fitness for spinal or general anaesthesia.[5] Thus, local anaesthesia can overcome the limits of spinal anaesthesia and can be given to patients with cardio-respiratory and other co-morbidities. The mean duration of procedure when local anaesthesia was given was 60.07±8.27 minutes and 70.80±11.26 minutes when spinal anaesthesia was administered, being significantly longer in spinal anaesthesia group (p<0.0001). The results of our study were similar to studies conducted by Hiquemat et al Bhedi et al, Kumar et al and Goyal et al where the mean operative time was significantly shorter in the Local anaesthesia group (Table 4).[6-8] Only in the study published by Goel et al the operative time was longer in the local anaesthesia group (72 mins) compared to the spinal anaesthesia group (51.5 mins) which the author attributed to the distortion of planes due to local anaesthesia.[9]

Total 17 out of 50 patients (34%) receiving local anaesthesia experienced intraoperative pain, out of which 7 patients had to be given additional sedatives. None of the patients of the spinal anaesthesia group developed intraoperative pain or had to be given additional sedatives which was significantly less (p<0.0001). Similar results were reported in study by Hiquemat et al , Wellword et al, Amid et al, Song et al and Callesen et al where intra-operative pain was the main cause of conversion from local to general anaesthesia.[10-13] In the study conducted by Bhomia et al only 6 patients (20%) receiving local anaesthesia required additional analgesics intra-operatively while none of the spinal anaesthesia patients had any complaints (p=0.001).[14] Intra-operative pain is caused by insufficient block by local anaesthesia either by wrong technique or inexperienced surgeon, large hernia sac, sac with adhesions which require dissection.[15]

When comparing both the groups in terms of post-operative surgical complications like surgical site infection (p=0.140), seroma formation (p=0.695), scrotal oedema (p=0.0295), both the groups were equivocal and none of the patients had complications of recurrence, hydrocoele formation, testicular atrophy. Regarding surgical site infection rate, Goyal et al and Niaz et al had similar results to our study where rate of SSI was more in

spinal anaesthesia group but not significantly greater.[16] Bhomia et al and Hiquemat et al reported similar findings regarding seroma formation. Similarly, for scrotal oedema Hiquemat et al, Bhomia et al and Saurabh Agrawal et al reported that incidence of scrotal oedema is more in spinal anaesthesia group but not significantly greater.[17]

In our study, patients in spinal anaesthesia group had significantly greater incidence of nausea, vomiting, headache and backache than local anaesthesia group. Similar findings were noted in studies by Hiquemat et al, Bhomia et al, Agrawal et al, Goyal et al in terms of incidence of headache. Bhomia et al, Agrawal et al demonstrated that complications of nausea and vomiting were higher in spinal anaesthesia group while Hiquemat et al noted equivocal findings.

In our study, the mean VAS score after 3 hours, 6 hours, 12 hours and 24 hours was significantly lesser in the local anaesthesia group compared to the spinal anaesthesia group (p<0.0001). In the study conducted by Bhedi et al pain relief was lesser for Local anaesthesia group after 6 hours (32.4 mm) than Spinal anaesthesia group (51.2 mm), (p<0.01, significant). Veen et al reported that patients receiving local anaesthesia had statistically significantly lesser pain than spinal anaesthesia group (p=0.021).[18]

Nordin et al and O'Dwyer et al published that local anaesthesia was superior than general or spinal anaesthesia for immediate post-operative pain relief.[18-20] Song et al reported that average VAS score of local anaesthesia patients (15±1.4) was significantly lesser than spinal anaesthesia patients (34±3.2). In the study conducted by Mohammad Sadegh Zamani-Ranani et al the average VAS was significantly lesser in the local anaesthesia group compared to the spinal anaesthesia group after 3, 6, and 12 hours (p<0.0001) (Table 5).[21]

Local anaesthesia solution consists of local long acting anaesthetic agents like Bupivacaine, Ropivacaine and Levo-Bupivacaine which results in local pain relief up to 6 hours after surgery.[18,22] Another contributing factor is the usage of adrenaline which prevents systemic absorption of the local anaesthetic agent thus prolonging its action. The average time taken for our patients to pass urine post-operatively was 3.27±2.46 hours in local anaesthesia group and 7.29±3.12 hours in spinal anaesthesia group which was significantly higher for spinal anaesthesia group (p<0.0001).

The incidence of urinary retention in our study and other studies which are similar is depicted in (Table 6). The higher incidence of urinary retention in spinal anaesthesia group is due to prolonged inhibition of bladder autonomic system.[12] In the present study, the average time taken for starting oral intake in the local anaesthesia group (1.79±1.03 hours) was significantly lesser than the spinal anaesthesia group (6.69±1.19 hours), (p<0.0001).

Table 4: Mean operating time comparison.

Name of study	LA group (minutes)	SA group (minutes)
Present study	60.07±8.27	70.80±11.26
Hiquemat et al	52.06±6.78	64.8±10.12
Bhedi et al	62.8	61.5
Kumar et al	39.84	56.36
Goyal et al	42.8±8.6	64.45±13.7

Reduced post-operative complications of local anaesthesia like nausea, vomiting can be directly associated with early oral intake in local anaesthesia group. The patients in local anaesthesia group were mobilised significantly earlier than the patients in spinal anaesthesia group (p<0.0001).

Table 5: Post-operative VAS scores in studies.

VAS score at post-operative time (hours)	Present study		Zamani-Ranani et al	
	LA	SA	LA	SA
3	3.7±0.86	5.06±0.77	22±4.19	31.33±13.08
6	4.84±1.11	6.01±0.93	31.53±11.03	43.06±11.92
12	2.00±0.72	3.10±1.26	25.86±6.68	37.53±12.24

Hiquemat et al, Bhedi et al reported significantly faster mobilisation of patients in local anaesthesia group while Dwywe et al and Kark et al reported no significant difference in return to daily activity in both the groups.[23] The patients in the local anaesthesia group were discharged significantly earlier than patients in the spinal anaesthesia group (p<0.0001).

These findings are similar to findings in studies by Hiquemat et al and Pradeep et al (Table 7). Song et al reported that the average time taken for discharge in patients of local anaesthesia was 158 mins, general anaesthesia 208 and spinal anaesthesia was 308 mins. Complications of spinal anaesthesia like emesis and retention were the cause of the delay in discharge of spinal anaesthesia patients. Another reason for the early discharge of local anaesthesia patient is due to lesser rate of complications associated with local anaesthesia.

A major limitation of the study is the lack of long term follow up of patients and hence chronic complications of

inguinal hernia repair like recurrence, chronic pain, testicular atrophy cannot be assessed with regards to use of local or spinal anesthesia. Clinical trials with higher number of patients with standardisation of anethesia induction protocols and surgical techniques are necessary to further evaluate this area of research.

Table 6: Incidence of post-operative urinary retention in different studies.

Variables	Post-operative incidence of urinary retention		
Study	LA	SA % (N)	P value
Present study	0	4.5 (9)	<0.0001, significant
Hiquemat et al	0	20 (6)	0.0098, significant
Niaz et al	0	16	Significant
Kumar et al	0	12	Significant
Goyal et al	0	20	Significant

Table 7: Mean hospital stays in different studies.

Mean hospital stay (days)			
Reference	LA	SA	P value
Hiquemat et al	1.73 ±0.87	2.73±0.9	<0.001, significant
Pradeep et al	1.76±1.2	2.32±1.46	<0.05, significant

CONCLUSION

Inguinal hernia continues to be the most common ailment encountered by general surgeon till date. Using local anaesthesia can usher surgeons towards day care or short stay surgery since it leads to fewer complications and quicker recovery time, which in turn results in early discharge. Shorter hospital stay causes reduced financial burden on the patients as well as hospitals. It can be considered for all patients including those not suitable for regional or general anaesthesia. It does not require an anaesthetist or extensive post-operative monitoring. Additionally, strength of the posterior wall of abdomen can be determined intra-operatively or a missed hernia can be identified. Thus, local anaesthesia is a safe, efficient and cost-effective option for inguinal hernia repair compared to spinal anaesthesia in terms of patient benefits and satisfaction.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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